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**REVIEW OF THE PRINCIPLES OF THE ECOSYSTEM APPROACH AND SUGGESTIONS  
FOR REFINEMENT: A FRAMEWORK FOR DISCUSSION***Note by the Executive Secretary***I. INTRODUCTION**

1. At the initial meeting of the Subsidiary Body on Scientific, Technical and Technological Advice (SBSTTA) of the Convention on Biological Diversity (CBD), it was recognised that “a holistic and not merely a conservation-oriented approach” was needed within the CBD. The second meeting of the Conference of Parties (COP) stated in decision II/8 that “...the conservation and sustainable use of biological diversity and its components should be addressed in a holistic manner, taking into account the three levels of biological diversity [genetic, species and ecosystem] and fully considering socio-economic and cultural factors”. The same decision stated that “...the ecosystem approach should be the primary framework of action taken under the Convention”. However, no definition of the “ecosystem approach” was provided.

2. A CBD-sponsored workshop in Malawi in 1998 provided the first comprehensive definition and description of the Ecosystem Approach (EA). The ‘Malawi Principles’ stimulated a number of recommendations and decisions within the SBSTTA and COP, and ultimately laid the foundation for COP Decision V/6 in 2000. Additionally, the conclusions of the Norway/UN Trondheim Conference on biodiversity and the ecosystem approach provided the basis for the 5 points of operational guidance. Decision V/6 endorsed the existing ‘description’, twelve ‘principles’ and five statements of ‘operational guidance’ for the EA, and also recommended the application of the principles, although it did not formally adopt these.

3. COP Decision VI/12 requested the development of “...proposals for the refinement of the principles and operational guidance of the ecosystem approach on the basis of case studies and lessons learned...” Following this decision, an international workshop on ‘Further Development of the Ecosystem Approach’ was held in Germany in 2002. The workshop report presents a number of new case studies, mainly from Europe, and recommends refinements to the principles and operational guidance, and methods

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\* UNEP/CBD/EM-EA/1/1.

to implement and monitor the ecosystem approach (Korn, Schliep and Stadler, 2003). The workshop report is available to this meeting as an information document.

4. The following review has been prepared by the Center for International Forestry Research (CIFOR), and will serve as a framework for discussion on the review of the principles of the ecosystem approach, as they are outlined in decision V/6 of the Conference of the Parties. Section IV of this document provides a review of the existing principles of ecosystem approach, while section V provides proposals for their further refinement.

## II. BACKGROUND

5. This review considers publications on the ecosystem approach and additional case studies from the Center for International Forestry Research (CIFOR), which are available in document UNEP/CBD/AHTEG-EA/1/2. While there are a number of review publications (e.g. Korn, Stadler, Maltby and Kerr, 1999; Smith and Maltby, 2001; Korn, Schliep and Stadler, 2003), it is clear that the authorship and editorial input have been from a small number of key people, normally the workshop facilitators. This has delivered consistent themes and recommendations, but may reflect a limited range of views.

6. One problem lies in the presentation of the case studies. There are 29 case studies summarised in the regional Pathfinder Workshops (see Smith and Maltby, 2001) and eleven others published on the CBD website: online at <http://www.biodiv.org/programmes/areas/forest/case-studies.asp>. While the CBD 'Case Study Guidelines' encourage analysis of the EA framework, principles, and operational guidance, the published analyses are mostly limited to statements of 'did apply' or 'did not apply', and to what thematic area and cross-cutting issue of the CBD. There is only limited information on whether the application of a principle has been useful (positive) or not (negative), and in what ways. This creates inconsistencies and difficulties in the review process.

7. Furthermore, most of the case studies applied the EA retrospectively, so the fact that principles were or were not applied explains little about their quality and more about what principles are either so general that they cover all possible applications (e.g. Principle 1: societal choice) or cover popular issues over recent years (e.g. Principle 2: decentralisation and Principle 12: cross-sectoral involvement). Nevertheless, the case studies do provide useful feedback through the concluding sections on 'lessons learned'. Much of the following review is based on these lessons. A summary of the points made from the EA review process is given in the annex to this document.

## III. CONCEPT AND FRAMEWORK

8. The central concept of the Ecosystem Approach is integration. The EA attempts to facilitate the removal of artificial barriers between economics, social science and ecology, and places humans firmly within the ecosystem model. This is needed to achieve a socially acceptable balance between conservation, resource use and sharing of benefits. The EA is not intended to be an alternative or competing concept, but one that unifies and consolidates existing scientific and social wisdom on ecosystem management.

9. While the basic concept of 'integration' is well received, many EA case studies highlight the conceptual and practical difficulties of integrating ecological, economic and social objectives into the management of specific areas. One fundamental reason for this is the widespread confusion over whether the EA is a descriptive 'conceptual framework' or a prescriptive 'practical framework'. The current

principles and operational guidance suggest elements of both, but neither is complete. The confusion is propagated by the lack of a logical hierarchy that links the theoretical foundation of the EA to the principles and operational guidance. Furthermore, there is considerable overlap between the twelve principles and five statements of operational guidance. This issue is discussed further in document UNEP/CBD/AHTEG-EA/1/4 (Proposals for development/refinement of the operational guidelines of the ecosystem approach).

10. Feedback from case studies and other analyses suggest two fundamental areas for clarification and refinement. First is that the EA must have a clear purpose, theoretical justification, logical hierarchy, internal consistency and ability to guide at all intended levels of application. Second, as the 'primary framework' for delivering the objectives of the CBD, the EA must be broad and flexible enough to accommodate the different ecological, political, economic and social conditions that prevail across different regions and thematic areas of the CBD.

#### **IV. REVIEW OF EXISTING PRINCIPLES OF ECOSYSTEM APPROACH**

11. The Oxford Dictionary defines a 'principle' as *a fundamental truth or law used as the basis for reasoning or action*. A number of the following principles do not satisfy this definition, either because they are statements of guidance or the fundamental truth or law is difficult to interpret. The principles are also vaguely worded, poorly structured and overlapping. For example, Principles 1, 11 and 12 share a common theme, as do Principles 2, 3, 7 and 8.

***Principle 1: The objectives of management of land, water and living resources are a matter of societal choices.***

12. This principle is true at the most general level, but does not expand on the question of how societal choices are made through trade-offs and compromises among different sectors of society. This is an important process since most sectors have different perceptions, values, interests, ambitions and influence over land, water and living resources.

13. Expressing societal choice through consensus between competing sectors is a difficult process that should not be underestimated. It requires strong civil society, democratic structures, well-informed participants and clear land ownership and resource security arrangements. Many of these requirements are not present in regions where there is a high priority for implementation of the CBD. Also, societal choices can work against the CBD, particularly in developing countries where the need for economic development may be detrimental to biodiversity.

14. This principle was widely applied in the case studies, but there was limited feedback on its utility. It is related to Principle 11 (use of all relevant information) and Principle 12 (cross-sectoral involvement).

***Principle 2: Management should be decentralized to the lowest appropriate level.***

15. Decentralisation is the conventional wisdom of much current conservation management. Numerous case studies describe successful ecosystem management activities at the local and community level through increased participation, empowerment, ownership and accountability. It is particularly effective when management time-scales reflect the requirements of local communities and not those of implementing institutions and donors, who can impose unrealistic deadlines.

16. This principle is a somewhat simplistic expression of a complex ideal, however. Decisions made by local ecosystem managers are often affected by, or subordinate to, environmental, economic, social and political processes at higher levels of organisation. If the principle is intended to reflect the multi-scale, multi-dimensional and hierarchical nature of ecosystems, then management is required at a number of different organisational levels.

17. In practice, a combined 'bottom-up' and 'top-down' approach is the best method to resolve the inherent centralisation/decentralisation dilemma in ecosystem management. As reflected in Principle 1, decentralisation requires a strong civil society, democratic structures, well-informed participants and clear land tenure and resource security arrangements. Some countries do not meet these requirements, while others may encourage decentralisation only to empower communities to make decisions that run counter to the objectives of the CBD.

18. This principle has been widely applied in the case studies. Although an expression of the conventional view that favours devolution in natural resource management on grounds of greater effectiveness, efficiency and equity, the principle is perhaps somewhat more controversial than it might seem. First, blanket application of the principle is unrealistic; some problems primarily require high-level intervention, with subsidiary local-level collaboration. Second, it presupposes that the necessary structures and capacity always exist at lower levels; they do not, and may first need to be developed. Third, and most importantly, management of problems in complex multi-scale systems is seldom confined to one level; complementary interventions are often needed at a number of levels. The principle is related to Principle 3 (off-site impacts), Principle 7 (spatial and temporal scale) and Principle 8 (long term management), and is repeated in Operational Guidance 4 (decentralisation to the lowest appropriate level).

***Principle 3: Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.***

19. This principle recognises that actions have consequences, but that the latter are seldom confined to the administrative and management boundaries in which impacts occurred, as these boundaries rarely coincide with ecosystem boundaries. It also reinforces the need for 'landscape level' ecosystem management. The tendency for the impacts of a change at one point in an ecosystem, in this case caused by management, to be transmitted non-linearly through the ecosystem and emerge in a disjunct manner at spatially separate but functionally linked sites, is a key ecosystem property that needs to be more emphasis in this principle. While the principle implies that broader scale management is needed to deal with adjacent and off-site impacts, it can not be assumed that local participants will necessarily be motivated in their small scale activities to meet broader landscape, regional and global objectives. Incomplete scientific understanding of ecosystem functioning, lack of appropriate incentive mechanisms and poor intersectoral cooperation are common constraints. Applying the principle may be difficult and additional measures might be needed to support it.

20. The principle has not been widely applied in the case studies, and there was limited feedback on its utility. This does not necessarily mean that it is unimportant, but rather that it is an incomplete part of a broader theme that combines Principle 2 (decentralisation), Principle 7 (spatial and temporal scales) and Principle 8 (long term management). Specifying some operational guidelines would help in the adoption of this principle.

***Principle 4: Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should:***

***Reduce those market distortions that adversely affect biological diversity;***

***Align incentives to promote biodiversity conservation and sustainable use;***

***Internalize costs and benefits in the given ecosystem to the extent feasible.***

21. Given that humans are an intrinsic part of ecosystems, and are driven largely by economic imperatives, this principle addresses an important issue. The interests of individuals and communities in conservation depend largely on the appropriate valuation of ecosystem goods and services, and the provision of suitable economic incentives and rewards associated with the use of natural resources. A number of case studies showed that conservation goals are difficult to meet until the short-term economic needs of local stakeholders are addressed. Nevertheless, meeting these needs may not necessarily require financial offset payments. Removing perverse incentives and market distortions instead could, in many cases, deliver significant financial savings or increased profits from alternative, conservation-oriented, land uses.

22. Equitable sharing of costs and benefits is difficult to apply in practice because conservation measures often impose livelihood costs on those local stakeholders who are least able to bear them. Incentives must be attractive enough to encourage those stakeholders to forego short-term financial rewards from resource exploitation in favour of substantially greater longer-term benefits. Short-term incentive packages, including social rewards such as improved education, health, infrastructure, transport, land tenure and resource security, are one possible option but it requires considerable explanation, negotiation and broad-based agreement, as well as rapid implementation. Not all costs and benefits can be internalised within local and landscape level ecosystems, however, as some ecosystem functions provide services at regional and global scales.

23. This principle has been widely applied in the case studies, and received considerable positive feedback. It is repeated in Operational Guidance 2 (enhance benefit sharing).

***Principle 5: Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.***

24. This principle addresses an important point, that ecosystem services – the benefits people obtain from ecosystems by way of provisions, regulation of environmental quality, support of biospheric process, and inputs to culture – depend on maintaining particular ecosystem structures and functions. The focus on ecosystems reflects an emerging paradigm shift in conservation from the previous focus on ‘charismatic’ and ‘keynote’ species, to a broader focus on entire ecosystems (of which those species are part). A number of case studies document the failures of certain conservation approaches that focus only on particular species.

25. Nevertheless, our understanding of ecosystem structure and functioning is imperfect and we lack generally agreed mechanisms for quantifying and assessing ecosystem services. The development of such mechanisms would support the implementation, and increase the impact, of the CBD.

26. This principle has been applied in some case studies, and is positively received. It is repeated in Operational Guidance 1 (ecosystem processes).

***Principle 6: Ecosystems must be managed within the limits of their functioning.***

27. The limits of ecosystem functioning are seldom known or clear, so the usefulness of this statement was questioned in the limited feedback received from the case studies. The rationale that accompanies the statement suggests that ecosystem functioning may be adversely affected if the limits on natural productivity, structure and composition are exceeded by temporary, unpredictable and artificially maintained conditions. This may be true in some cases, but it denies the dynamic nature of ecosystems and their capacity to accommodate intermittent or sometimes sustained changes in disturbance regimes and environmental conditions. As noted in some case studies, there are few agreed methods to quantifying 'functional limits' and 'carrying capacities' under natural or managed ecosystem conditions, so caution should be advocated. The word 'cautious' in the accompanying rationale suggests that the principle is an attempt to introduce a variation of the Precautionary Principle. If so, then the wording needs to be changed to reflect this intention more clearly.

28. The principle was seldom applied in the case studies, and received mostly negative feedback. It is an incomplete part of a broader theme that overlaps with Principle 10 (balance between conservation and use).

***Principle 7: The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.***

29. Ecosystems are not aggregations of separate groupings of organisms or functional entities operating at some preconceived spatio-temporal scale. Instead, the components of an ecosystem are arranged in a series of functionally distinct but hierarchically connected levels of organisation on the basis of differences in the rates of their constituent processes and the spatial limits to their functioning. Lower levels of organisation function at smaller spatial scales and shorter time scales than those above them. The high frequency dynamics of processes at lower levels of organisation (*e.g.* individuals) tend to be attenuated or dampened by the slower rates of response of higher-level processes (*e.g.* populations). This constraint of lower-level functioning by higher organisational levels is the inevitable consequence of the asymmetry in rates between them.

30. There is also no central hierarchy or fundamental level of organisation within an ecosystem. Each level is important or irrelevant depending on the question being asked. In view of this, the principle could be improved by adding "...appropriate to management objectives", though experiences from a number of case studies suggest that, to maintain or enhance the provision of ecosystem services and goods, ecosystems need to be managed simultaneously at multiple spatial and temporal scales, to foster the integration of ecosystem, social, economic, institutional and political processes.

31. This principle has been widely applied in the case studies and received considerable positive feedback. It is strongly related to Principle 2 (decentralisation), Principle 3 (off-site impacts) and Principle 8 (long term management). It shares a common theme with Operational Guidance 4 (decentralisation to the lowest appropriate level).

***Principle 8: Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.***

32. The intention of this principle is apparently to counter the natural tendency of people to favour short-term gains over potentially greater longer-term benefits. As outlined above, ecosystem functioning occurs at a range of time scales and none is more fundamental than the other. Management should thus be compatible with all time scales that affect the provision of ecosystem services and goods. While long-term economic and political support is seen as critical to ecosystem management, short-term economic and social support is equally critical, particularly to local stakeholders. A number of case studies emphasise this point.

33. The aim of specifying ecosystem management objectives only for the long term, as implied in this principle, is further complicated by the inevitable occurrence of extreme events that might undermine returns on investments in land, labour and capital. In conditions of high uncertainty, there is a greater tendency to discount future benefits, thereby making low-risk, short-term gains a logical human desire. It is also normal for people to seek to exploit a system in the short term and invest their returns in some other field of human endeavour, where the rates of return are higher. If others in society wish to counter that tendency, because things that they value risk being lost or diminished, then they need to reflect their preference by outbidding those with short-term objectives (Principle 4).

34. This principle has been widely applied in the case studies, but it remains controversial. It seems to be an unnecessarily prescriptive variation of Principle 7 and is thus largely redundant.

***Principle 9: Management must recognize that change is inevitable.***

35. This reflects a fundamental property of ecosystems, that ecosystems are dynamic in their composition, structure and functioning. This variability appears to be a key to the persistence of ecosystems. Due to the on-going fluctuations in ecosystem structure, functions and composition (over space and time), organisms are constantly being tested, selected and driven through evolutionary processes that maintain genetic variability within populations. Moreover, given the hierarchical structure of ecosystems, the range of variation changes depending on the organisational level in question and its spatial and temporal scale of functioning. The adaptive management approach attempts to overcome the uncertainty introduced by this variability through the use of systems thinking, action research and institutional learning.

36. The importance of adaptive management was recognised in many of the case studies, but respondents noted that the concept is poorly developed and implemented in most organisations responsible for ecosystem management because of both financial and technical constraints. As a result, management is still largely inflexible and unresponsive. One concern was about how 'inevitable' major anthropogenic change should be treated, whether as a major externally induced disturbance, or as something natural and normal.

37. The principle was not widely applied in the case studies, but was positively received. Attention needs to be paid to the constraints limiting the wider application of this principle. While application to date has been limited, the principle remains a key component of the EA. It is repeated in Operational Guidance 3 (adaptive management).

***Principle 10: The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.***

38. Most ecosystems can be exploited to some extent, and within limits, beyond which structure and functioning can change sufficiently to lead to a loss of biodiversity and declines in the provision of ecosystem goods and services. Part of the problem is due to the direct impact of exploitation on the species concerned and how this affects their interactions with others in the system, but part of it also lies with the collateral damage done during exploitation (*e.g.* by-catches in fisheries, destruction of non-timber species during logging, changes to ecosystem functioning following changes in structure induced by timber harvesting). Low-impact modes of exploitation have been developed and tested in support of the concepts of sustainable development and intergenerational equity, but uptake is still limited. More importantly, the problem still remains one of identifying the limits to ecosystem functioning, within which to achieve 'balance between' and 'integration of' conservation and sustainable use.

39. In the case studies, the importance of 'multiple use' landscapes that allow stakeholders real access to some resources in return for conservation of others was emphasised. Respondents from a number of case studies also emphasised the need to dispel the myth that 'win-win' situations between development and conservation objectives were widely achievable, and concentrate instead on understanding how trade-offs and equitable compromises could be attained.

40. Given its fundamental appeal, this principle was widely applied in the case studies and received positive feedback. It is related to Principle 6 (management within the limits of ecosystem functioning).

***Principle 11: The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.***

41. It is not clear what fundamental truth or law this principle represents. Maybe it is that different people with different perspectives can view ecosystems at different scales. Information on ecosystems thus comes from various sources, all of which add to the sum of human knowledge.

42. The need to use all available information, from indigenous knowledge to complex computer models, was supported in a number of case studies. Poor access to information and the lack of capacity within organisations to interpret multi-disciplinary information constrain the implementation of this principle, however.

43. Given its general nature, this principle was widely applied in the case studies and received positive feedback. It is linked to Principle 1 (societal choice) and Principle 12 (cross-sectoral involvement).

***Principle 12: The ecosystem approach should involve all relevant sectors of society and scientific disciplines.***

44. This principle reiterates the social science principle of promoting stakeholder participation and decision making. Respondents in most case studies reported that successful ecosystem management was facilitated by the participation of a wide range of stakeholders and sectoral interests during all phases of the project cycle. The most relevant stakeholders in this regard include both those whose actions affect the outcome of an activity, and those who are affected by the activity.



45. Given its fundamental appeal, this principle has been widely applied in the case studies and received positive feedback. It is linked to Principle 1 (societal choice) and Principle 11 (use of diverse information), and is repeated in Operational Guidance 5 (intersectoral cooperation).

## V. SUGGESTED REVISIONS TO THE ECOSYSTEM APPROACH PRINCIPLES

### A. *Rationale*

46. The foregoing review highlights two important points about current attempts to operationalise the Ecosystem Approach. First, there is a lack of consensus on the validity and applicability of some of the principles, stemming perhaps more from the way those principles are expressed than necessarily from any fundamental disagreement with the underlying ideas embodied in the principle. Second, there are some who feel that continued refinement of the wording of the principles is unproductive and that Parties to the Convention on Biological Diversity should move ahead in implementing the Ecosystem Approach and leave any revision of the principles to follow the experience gained in implementation. Whereas there is some merit in the second view, the reality is still that lack of clarity in the some of the existing principles results in uncertainty as to just what should be implemented, with few obvious guidelines having been proposed. At the same time, there is clear redundancy between some of the principles and the current operational guidelines.

### B. *The concept of the Ecosystem Approach*

47. The CBD defines the Ecosystem Approach as a strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way. Three propositions appear to underpin this concept.

1. The conservation of biological diversity is necessary to maintain the production of ecosystem goods and services.
2. People are, and always have been, integral to most ecosystems. They depend on the flow of energy, water and matter to sustain themselves, both from anthropogenic agricultural, pastoral, forestry or aquatic landscapes, and from more diverse 'natural' ecosystems. As such, humans can affect ecosystem structure and functioning, sometimes substantially. They should have a vested interest in managing both the environment and their patterns of use so as to maintain the flow of goods and services, and therefore in conserving the biodiversity on which these flows depend.
3. Given that people depend to a greater or lesser extent on the production of ecosystem goods and services, there should be equity in access to and use of these goods services, otherwise there will be no incentive to maintain ecosystem structure and functioning and the benefits that come with it.

48. These three propositions are reflected in the three objectives of the CBD, namely conservation, sustainable use, and equity in the sharing of benefits in the use of genetic resources (and, one should add, other components of biodiversity as well).

### C. *A framework for the revisions*

49. The suggested revised principles and associated operational guidelines have been drawn up within a framework of six interconnected themes and associated key questions: **provision of environmental goods and services** (what is being managed within ecosystems and for what purpose?); **building consensus** (who will undertake the management?); **providing incentives for management** (what are the incentives for management?); **balancing conservation and use of biotic resources** (how can

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different management objectives be reconciled and integrated?); **cross-scale integration** (how best to integrate management across multiple scales of interaction and response?); and **building adaptive capacity** (how best to develop the capacity to initiate, learn from and thereby sustain activities?).

50. In the following section, the existing principles have been re-worded and re-ordered in line with this suggested structure. In essence, the principles are the same as those already adopted by the CBD, taking into account some of the suggestions of the Vilm workshop (Korn, Schliep and Stadler, 2003) for restructuring and rewording. However, they have been extensively reworked in an attempt to bring out what seems to be the underlying tenets. Both in their original form and as modified at the Vilm workshop, the 'principles' sounded more like operational guidelines (imperatives such as "should" and "must" were frequently used), than as statements of principle reflecting some fundamental truth, law or ideal that could serve as the basis for action. The order of the original EA principles is given below in square brackets.

#### **D. Suggested revised principles**

##### *Theme 1. Provision of environmental goods and services*

#### **Principle 1: Ecosystem services, functions and processes** [EA Principle 5]

*Ecosystem services – the benefits people obtain from ecosystems by way of provisions, regulation of the human environment, support of biospheric processes, and inputs to culture – depend on maintaining particular ecosystem structures and functions.*

**Rationale:** The conservation, use and management of biological resources takes place in an ecosystem context. These activities potentially have consequences in terms of changes in the structure and functioning of the ecosystem of which the resources are part. This can affect the production of goods and services, either positively or negatively. Whether such impacts arise, and with what effects, depends greatly on the particular structure of the ecosystem concerned, the nature of the linkages among the components, and the resulting processes and functions. While the precise impacts and effects are often system-specific, they would appear to be governed in general by the broad properties of ecosystems. Understanding these properties and their implications both for ecosystem structure and functioning, and for how we observe and manage those features, is critical to the successful application of an ecosystem approach. Appreciating how different resource uses, conservation actions and management activities fit within an ecosystem is necessary if the impacts of such activities on the continued provision of ecosystem goods and services is to be understood and assessed more broadly.

##### *Theme 2. Building consensus*

#### **Principle 2: Societal choice** [EA Principle 1]

*The objectives for managing land, water and living resources is a matter of societal choice, determined through negotiations and trade-offs among the stakeholders with different perceptions, interests and intentions.*

**Rationale:** Human society is diverse in the kind and manner of relationships that different groups have with the natural world, each viewing the world around them in different ways and emphasising their own economic, cultural and societal interests and needs. Given this diversity, negotiations and trade-offs are necessary to establish broadly acceptable objectives for the management of particular areas and their living resources. Indigenous peoples and other local communities are especially important stakeholders in this regard as they live on the land and can more directly affect its future. Their rights and interests have

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to be recognised and incorporated into conservation management planning. Thus ecosystems need to be managed in a fair and equitable way both for the tangible and intangible benefits received by people and for their own intrinsic values. This needs to be negotiated among the relevant stakeholders at local, national, regional and international levels, where appropriate, and incorporated into management.

**Principle 3: Cross-sectoral integration** [EA Principle 12]

*The complexity of ecosystem management for sustained use and conservation requires integrating the activities and actions of many different stakeholders.*

**Rationale:** The dynamic properties of ecosystems such as resilience or persistence depend greatly on the nature, extent and intensity of interactions within and among species, between species and their abiotic environment, and on physical and chemical interactions within the environment. These interactions themselves vary among sites and through time. Managing this diversity is complex, more so when many of these interactions and their outcomes are poorly understood. Uncoordinated sectoral initiatives only add to this complexity and uncertainty. In this situation, the involvement of all relevant stakeholders and technical expertise in planning and carrying out joint activities, sharing management resources, or simply exchanging information, whichever is appropriate, is essential for effective management.

**Principle 4: Diversity of information and understanding** [EA Principle 11]

*Ecosystems are multi-scale, multi-dimensional entities that can be viewed at various scales and from different perspectives, each yielding unique but complementary information and insights.*

**Rationale:** There is no single level of organisation at which to understand and best manage ecosystem functioning. Each level – for example, genetic, population, species, community or landscape – is important or irrelevant, depending on the nature and scale of the problem being addressed and on the perspective and aims of the managers. To develop a holistic understanding of the structure, functioning and interrelationships of these different levels and how best they might be managed for particular ends requires information from a range of sources, including local indigenous knowledge.

*Theme 3. Providing incentives for management*

**Principle 5: Ecosystem management in an economic context** [EA Principle 4]

*Many ecosystems provide economically valuable goods and services, thus predicating the need to understand and manage ecosystems in an economic context.*

**Rationale:** The main threats to biodiversity at various scales include large-scale stresses such as global climate change, loss or fragmentation of habitat, the introduction and spread of alien species and unsustainable resource extraction. Of these, habitat degradation or loss pose the greatest and most immediate threats. Despite the production of economically valuable goods and services, natural ecosystems are consistently undervalued. Those who live on the land receive little reward for protecting such systems, while those who benefit from the goods and services seldom pay the real costs of production (including conservation). As a result, natural landscapes and other components of biodiversity are vulnerable to being replaced by alternative land-use systems. This land conversion is often further

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encouraged by subsidies and other perverse incentives. To counter this requires the realignment of incentives to allow those who control the resources to benefit more directly from their conservation, and to require those who use environmental goods and services, directly or indirectly, to pay more for the privilege.

#### *Theme 4. Balancing conservation and use of biotic resources*

##### **Principle 6: Balance between conservation and use** [EA Principle 10]

*Sustainable development requires management regimes that balance conservation of biodiversity with judicious use of natural resources.*

**Rationale:** Biological diversity is important both for its intrinsic value and for its key role in providing the ecosystem goods and services on which humans ultimately depend. In the past, the tendency was to rigidly protect some components, seeking to prevent their use, reducing the variability in their dynamics, and excluding disturbances, while adopting a *laissez faire* attitude to the fate of others. More recently, however, the trend has been towards more flexible arrangements in which conservation and use are seen as end-points on a continuum, with management varying according to local context. The same applies to the use of land, with a range of measures being applied along a continuum from ecosystems that are strictly protected, through mixed land-use systems, of which nature conservation and sustainable use both are part, to areas that have been wholly transformed by human activity, but which may nevertheless require some form of environmental management to ensure their continued productivity in their new form. Overall, the aim is to maintain or restore the benefits that flow from the array of functions provided by biological diversity at the ecosystem level, irrespective of the system concerned.

##### **Principle 7: Limits** [EA Principle 6]

*There are limits to the level of demand that can be placed on an ecosystem, though current ecological understanding is limited in knowing what the limits are. In such cases, a precautionary approach, coupled with adaptive management, is advised.*

**Rationale:** There are limits to the demands (production, offtake, assimilation, detoxification) that can be made on ecosystem services. Likewise, there are limits to the amount of disturbance that ecosystems can tolerate, depending on the magnitude, intensity, frequency and kind of disturbance. If these limits are exceeded, an ecosystem undergoes substantial reorganisation in composition, structure and functioning, usually with a loss of biodiversity and a resulting lower productivity and assimilative capacity. These limits are not static but may vary across sites, through time, and in relation to past circumstances and events. There is considerable uncertainty and ignorance about the actual limits (thresholds for change) in different ecosystems, however. Under such circumstances, management, whether for conservation or planned sustainable offtake, should be appropriately cautious. The potential exists in many instances to use the results of past management to adjust future decisions. In some situations, this adaptive management approach would benefit from more active, planned interventions aimed at identifying particular critical limits (see Principle 12). Since the demands on and disturbances to ecosystems stem largely from human decisions and action, management within limits will often require negotiation and agreement among different stakeholders to constrain their activities (see Principle 2).

*Theme 5. Cross-scale integration***Principle 8: Scale matters** [EA Principle 7]

*The driving forces of ecosystems, including those due to human activities, vary spatially and through time, necessitating management responses at appropriate scales.*

**Rationale:** Ecosystems are not simply aggregations of separate groups of organisms or functional entities operating at some predetermined spatial and temporal scale. How the components are perceived to be arranged spatially depends partly on the scale of observation. At one scale, individuals of a species may seem relatively regularly and continuously distributed. At another, the distribution of the same species may be discontinuous. Likewise with time: at one time scale (*e.g.* monthly, annually) a component or process may appear to exhibit constant periodicity; at another, longer or shorter time scale, the temporal dynamics may appear to be episodic or chaotic (unpredictable). The dynamics of human social and economic systems show great complexity in varying across scales of space and time. Depending on objectives, markedly different institutional arrangements may be needed to deal with this spatial and temporal variability.

Analyses of both ecosystem properties and human institutional arrangements at a particular scale will reveal the processes and driving forces that operate at that scale, but not those that function at a different scale. Effective management of ecosystems, including human components, requires multi-scale analyses and response. More importantly, perhaps, given that ecosystem components and processes are linked across scales of both space and time, management interventions need to be planned to transcend these scales.

The failure to take scale into account can result in temporal mismatches between the timeframes of policy makers and planners (usually short-term) relative to the scale of functioning of the ecosystem properties they aim to influence (often long-term). (The reverse can also be true: bureaucratic inertia can delay the quick management response needed to address a rapidly changing environmental condition.) Spatial mismatches are also common, for example between administrative boundaries and those of the ecosystem properties or related human activities that they are designed to regulate. Functional mismatches occur when resource users or managers limit the scope of concern for their actions, thereby ignoring possible wider consequences.

**Principle 9: Subsidiarity** [EA Principle 2]

*Natural resource management is best carried out at the level of the resource production system.*

**Rationale:** This is a variation of the subsidiarity principle, which states that higher-tier authorities should not assume functions that can be carried out more appropriately by lower-tier associations; or, alternatively, problems are best resolved at the level of organisation at which they occur. This principle is in line with the current trend towards increasing devolution of responsibility for natural resource management to local institutions, on the grounds of greater efficiency, effectiveness and equity. The assumption is that the closer the management decision-making is to the ecosystem, the greater the participation, responsibility, ownership, accountability and use of local knowledge will be, and that all these are critical to the success of management. Proximity to and more direct dependence on the natural resource base makes also for a tighter feedback between ecosystem responses to the use and

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management of resources by local communities and people's subsequent actions, thereby aligning the scales of management and response more closely (see Principle 8). In principle, this should lead to more sustainable management practices, subject to there being adequate capacity and resources locally to implement and sustain a management regime.

Nevertheless, decisions made by local resource managers are often affected by, or even subordinate to, environmental, social, economic and political processes that lie outside their sphere of influence, at higher levels of organisation. Resource management, therefore, is generally not something that occurs at a single level of decision-making and action. Applying an ecosystem approach to natural resource management requires complementary and coordinated plans and actions at a number of different organisational levels (see Principles 3 and 8).

**Principle 10: Take account of offsite impacts** [EA Principle 3]

*The open structure and connectedness of ecosystems ensures that effects on ecosystem functioning are seldom confined to the point of impact or only to one system.*

**Rationale:** Ecosystems are not closed systems. They are largely open, connected to other systems through the flow of energy, matter and information, and the movement of organisms. The effects of management interventions are therefore not confined solely to the point of impact nor are they attenuated smoothly with increasing distance from that point. Instead, they are often transmitted through the system (and even transferred to other systems) in a disjunct and non-linear manner, often with associated time lags. Management interventions in ecosystems therefore can have unknown or unpredictable effects on other ecosystems. Careful consideration and analysis is needed of where and when impacts may appear. This may require re-organising the ways in which institutions make decisions (and which institutions are involved) and re-evaluating what kinds of decisions are required.

**Principle 11: Management timeframes** [EA Principle 8]

*Time matters. Ecosystem processes function with different periodicities and time lags over a range of temporal scales. Choosing the appropriate time scale for management, depending on the problem concerned, is crucial.*

**Rationale:** The dynamics of ecosystem processes vary with time. Some are periodic, linked to daily, monthly, annual or longer cycles; others are irregular or episodic, linked to disturbances caused by extremes of climate, fire, pests, disease and local human activities and linked to policy, social and economic shocks. Current processes may also have been entrained by past events. Time lags occur due to buffering and slow feedback. Human activities likewise vary through time, often with similar lags in response. Time needs to be considered explicitly in formulating management plans, so that the appropriate time scale for management can be selected, thereby obviating a mismatch between the management timeframe and that of the processes management is designed to influence. People generally favour short-term benefits over those accruing in the longer term, especially where there is uncertainty about the future. As a result, there is tendency to focus on those components and processes with shorter time dynamics, and slower, longer-term changes get overlooked. Ecosystem managers need to make allowance for this when formulating their plans.

Note: This Principle should probably be combined with Principle 8 (Scale matters).

*Theme 6. Building adaptive capacity*

**Principle 12: Adaptive management - learning by doing** [EA Principle 9]

*Change in ecosystems is both natural and inevitable, and requires management policies and actions that, while satisfying social objectives, also promote ongoing learning and improved understanding of the changing circumstances, thereby building the flexibility and capacity to adapt to new situations.*

Rationale: Ecosystems change, including species composition, population abundance, human-resource interactions. Hence, management should adapt to the changes. Apart from their inherent dynamics of change, ecosystems are beset by a complex of uncertainties and potential "surprises" in the human, biological and environmental realms. Because of multiple feedbacks and lags in feedback, many processes display complex non-linear dynamics, with outputs not being simple linear functions of the inputs. This complexity in both structure and function requires that management for the conservation of biodiversity be flexible and adaptive, both as a response to changing circumstances and to take account of new knowledge and understanding. Adaptive management ('learning by doing') should be used to generate new knowledge and reduce uncertainties, thereby allowing the manager to anticipate and cater for such changes and events.

Ecosystem management must therefore involve a learning process that will help to adapt methods and practices to improve the ways in which these systems are being managed and monitored. Flexibility is also needed in policy-making and implementation. Long-term, inflexible decisions are likely to be ineffective or detrimental. Ecosystem management should be envisaged as a long-term experiment that builds on its results as it progresses. This "learning-by-doing" will also serve as an important source of information to gain knowledge of how best to monitor the results of management and evaluate whether established goals are being attained.

*Annex***ECOSYSTEM APPROACH REVIEW NOTES**

The following notes elaborate on the main text of this paper, highlight points from specific case studies and reference individual sources. These include:

- **Source A:** Smith, R. and Maltby, E. (2001). *Using the Ecosystem Approach to Implement the CBD. A Global Synthesis Report Drawing Lessons from Three Regional Pathfinder Workshops*. Royal Holloway Institute for Environmental Research, University of London.
- **Source B:** Korn, H., Schliep, R. and Stadler, J. (2002). *Further Development of the Ecosystem Approach*. Federal Agency for Nature Conservation, Berlin.
- **Source C:** Smith, R. and Maltby, E. (2000). *The Ecosystem Approach under the CBD: from Concept to Action*. Royal Holloway Institute for Environmental Research, University of London.
- **Source D:** Global Biodiversity Forum (2002). *Managing Forest Ecosystems for Sustainable Livelihoods. Report of the GBF16 Workshop*. Global Biodiversity Forum.
- **Source E:** Global Biodiversity Forum (2002). *Governance for Sustainable Development: The Contribution of the Ramsar Convention on Wetlands*. Global Biodiversity Forum.

The alphanumeric code after each entry refers to the source and page number (e.g. A10 refers to page 10 from source A – Smith and Maltby, 2001).

**A. EA Concept and Framework*****Positive feedback***

- EA is defined as holistic, flexible, socially oriented, scientifically based, and respectful of cultural preferences, usage and traditions. (A10)
- EA is a framework for action that links biological, social and economic information and achieves a socially acceptable balance between nature conservation priorities, resource use and sharing of benefits. (A12)
- EA is a framework that removes the artificial barriers between the human economy, social behaviour and natural environment - and places humans firmly within the ecosystem model. (A12)
- The overall concept of EA is already embraced by many practitioners and organisations, and applied in limited ways. (A31)
- The early adopters of the EA include World Bank, EC, USAID, UNEP, WRI - but with a slight degree of conceptual variation. (B34)
- The EA is not a new alternative or a competing concept or approach, but more a kind of framework tool codifying the best existing management practices and ideas. (B58)
- The EA is a potentially powerful tool because it: (a) recognises the impact of scale in changing or overlaying values; (b) gives weight to local peoples' understanding of and commitment to ecosystems; (c) encourages outsiders to build on local capacities rather than ignoring them or destroying them. (D2)

***Negative feedback***

- There is common confusion that the ecosystem approach is tailored to the 'management needs of ecosystems', as opposed to being a framework for thinking and acting 'ecologically'. (A12)

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- Principles and operational guidelines were found to be theoretical, very general and lacking in guidance on how they should be applied to address specific problems. (A16)
- The operational guidelines are not sufficient. (A17)
- There is inconsistency in understanding the meaning of EA. (A31)
- Further clarification of the EA is needed as there are different perceptions on 'ecosystems' by different stakeholders. (B21)
- It is unclear whether the EA is a 'framework' or 'modus operandi' for ecosystem management. (B21)
- The EA may not be sufficiently connected to the international debate on integrated management. (B21)
- The EA lacks clear distinction between facts and values. A distinction is needed between the level of politics (which relates to societal choice) and the level of science (which provides facts as a basis for societal choice). (B22)
- The preparedness in science for the paradigm shift involved in the implementation of the EA is limited. (B31)
- There is no general agreement on what the EA concept means exactly in terms of management approaches and management outcomes. (B31)
- The EA is a demanding approach in terms of complexity and co-ordination requirements - and the need of a paradigm shift make adoption difficult. (B34)
- The concept lacks guidance for the balancing between conservation and sustainable use, particularly in view of the renewed emphasis on poverty reduction. (B34)
- Issues related to equity and livelihoods are not adequately addressed in the EA principles. The principles do not consider how ecosystems contribute to and affect livelihoods. The interpretation of the principles related to livelihoods tends to focus on economic benefits, while issues related to livelihood security are not normally considered - that is, the resilience of the ecosystem to sustain the production of goods and services. (B44)
- Besides the specific economic benefits derived from the management and use of ecosystems, other values tend to be overlooked in the principles. (B44)
- The wording of the 12 principles and 5 operational guidelines are so general that it permits a host of different interpretations. (B52)
- Some case studies demonstrate that it is not an easy task to integrate all ecological, economic and social objectives into the management of specific areas. (B52)
- The wording of the EA is too general to serve as a directive for action on an operational level. (B52)
- What is the added value of the EA - many integrated approaches are already in use. (E8)

### ***Lessons learned***

- EA is a framework for holistic decision making and action, not guidelines for managing specific ecosystems. (A6)
- Problem specific practical guidelines (or user guides) that supplement the operational guidelines, need to be developed. (A6)
- Monitoring of appropriate indicators is vital for adaptive management, yet guidelines and case studies on this theme are insufficient. (A7)
- The operational guidelines should be supplemented with problem-specific guidelines that would help users overcome any vagueness. (A10)
- Example of on-the-ground steps for mainstreaming the EA. (tables 2 and 3) (A11)
- Need to identify a sub-set of core principles for each type of problem, so that it would be possible to define EA more simply and concisely using fewer principles. (A17)

- It is essential to recognise the importance of regional context, different societal priorities and cultural perspectives in the application of the EA. (A31)
- Problem-specific and practical guidelines should be developed to help implement the EA at the field level. (A34)
- The EA could integrate all other approaches (management and conservation) and methodologies to deal with complex situations. (B7)
- The principles of the EA need to be checked for consistency, redundancy and hierarchy, while clarifying their wording and improving their logical sequence. (B7)
- There is a need to identify elements for guidance on the more effective implementation of the EA on the ground. (B7)
- Indicators and 'targets' are needed to monitor the application of the EA - in some cases considerable efforts will be needed to develop indicators (examples on B19-20). (B18)
- The role of objectives, monitoring and indicators needs to be further clarified in the concept of the EA. (B21)
- Technical or ambiguous terms in the principles of the EA should be clearly defined. (B21)
- The on going diversification of resource management regimes should be reflected in the principle of the EA. (B22)
- There should be an improved balance in the EA between conservation and sustainable use when considering poverty reduction. (B22)
- The principles of the EA should be seen as inter-linked and complimentary. (B24)
- Effective diffusion of the EA depends on the theoretical justification, internal consistency, ability to guide and connection to existing management approaches. (B30)
- Due to the high variability in local conditions in which management takes place, the procedures used to apply the EA must be flexible enough to accommodate the variation in ecological, political, economic and social conditions that prevail in each instance. (B43)
- It should be ensured by some form of overall requirement that all principles of the EA are applied in an integrated way - isolating individual principles from the context may even be harmful or lead to misinterpretation. (B48)
- The relationship of the EA to existing environmental management approaches should be more clearly expressed to avoid misunderstandings and competition. (B58)
- The EA should be used as a tool to inform decision making processes at planning levels (and not be only retrospective). (E3)

### ***B. Assessment of the EA Principles***

**Principle 1** *The objectives of management of land, water and living resources are a matter of societal choices.*

#### ***Positive feedback***

None

#### ***Negative feedback***

- Active and sustained participation can not be assumed even when all stakeholders are encouraged to be involved. (A7)
- Realising societal choice typically requires a balance between competing views that are not easily reconciled - the difficulties should not be underestimated. (A19)
- There are uncertainties on the meaning of 'societal choice'. (B22)

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- Societal choice is influenced by land ownership structures. (B76)
- Societal choice requires democratic structures - which are not everywhere. (B83)
- Societal choice can work against biodiversity and issues in the CBD - in the developing world people want economic development, a choice that will in many circumstances be detrimental to biodiversity. (C8)

### *Lessons learned*

- Societal choice is most effective after thorough public discussion and tools for its support are still needed. (B22)
- Societal choice can only work in countries with a strong civil society and individual ownership over land and resources. (B57)
- There is a need to invest in education and communication of conservation issues and their relevance to different sectors of society, and there is a need to promote conservation as a land use that contributes to job creation and economic growth. (B60)
- It is important that decisions are made by 'well-informed' participants. (D8)

**Principle 2:** *Management should be decentralized to the lowest appropriate level.*

### *Positive feedback*

- Design of the wildlife protection program was in response to the expressed needs of the participating population. (B36)
- The success of the project in changing attitudes towards natural resources comes from the local involvement of diverse stakeholders, including churches, research institutions, NGOs, business and government. (B37)
- Security of tenure over customary resources would improve management. (B38)
- Community empowerment would have prevented illegal logging activities. (B38)
- The closer the management and decision making is to the community, the greater the ownership, accountability and participation by the communities. (B40)
- Success of management relies on local community organisations and their internal regulations. (B42)
- Conservation 'champions' appointed from local organisations led the sub-regional planning process - and this was efficient and effective. (B60)
- Project has benefited from being non-prescriptive and not being implemented by regulatory agencies. (B88)
- A common factor in most successful community initiatives at natural resource conservation is the fact that they are decentralised, site-specific and varied in their objectives and approach. (D8)

### *Negative feedback*

- In practice there are significant capacity and structural obstacles to decentralised management. (A7)
- Higher levels of organisation are often essential to implement local actions. (A7)
- Government still needs to retain the right to intervene in situations where actions from some communities can negatively impact others. (B36)
- The level of intervention and the organisation involved depends on the issue and it's scale. Some management plan policies need intervention at the central government level, but they also require the collaboration of local level organisations if they are to be a success. (B47)
- Decentralisation in Indonesia is posing obstacles to the implementation of the EA. (B58)

- Decentralisation cannot be seen as a universal solution to institutional mismatches. (B23)
- There remains a very strong command and control mindset amongst the responsible government ministries (in the forest sector), and thus there are very few cases where authority has been formally granted to local people to manage and benefit from the use of ecosystems. (B43)
- Decentralisation requires democratic structures - which are not everywhere. (B83)
- Empowerment means giving people the right to make decisions, but they can make decisions contrary to conservation interests. (D9)

### *Lessons learned*

- A combined bottom-up and top-down approach may often be the best strategy for identifying the most appropriate management scale and mechanism. (A20)
- Conservation with or through communities needs to work at the pace of those communities and not the pace of outsiders such as implementing institutions, donors or other externally determined deadlines. (B36)
- A developed and participatory approach is vital, but the frame of reference of higher authorities has to be taken into account. (B17)
- The EA clearly needs a multi-level perspective and sufficiently flexible institutions to tackle the inherent centralisation/decentralisation dilemma in ecosystem management. (B30)
- More authority must be given to local people to manage and benefit from the use of ecosystems. (B43)
- Delegation of authority is an essential element to ensure that managers are accountable for their actions, however, to be effective, governance roles at different levels must be congruent. (B43)
- Important considerations for decentralised management include: the need to build local capacity, the need to agree on common goals; and co-ordination of local action with agreed upon goals. (B61)
- Decentralisation needs technical support and backstopping from the various levels of government - the scale are not mutually exclusive but closely interrelated. (E3)
- Decentralised management requires that capacity to deal with integrated management of natural resources is developed at that level. (E3)

**Principle 3:** *Ecosystem managers should consider the effects (actual or potential) of their activities on adjacent and other ecosystems.*

### *Positive feedback*

- The impact on surrounding ecosystems is also considered: acid sulphate soils leach pollutants into aquatic ecosystems. (B56)
- The lack of intersectoral cooperation is recognised to be a major obstacle to making management decisions that consider the effect of actions on adjacent ecosystems. (B58)

### *Negative feedback*

- It cannot be assumed that participants will be motivated in small-scale activities that meet landscape scale objectives. (A19)
- The significance of functional linkages between ecosystems is often not fully recognised by ecosystem managers. (A21)
- Constraining the effective implementation is the fact that responsibilities for management of natural resources are fragmented across institutions, and administrative and management boundaries do not always coincide with ecosystem boundaries. (B61)

***Lessons learned***

- Financial and other mechanisms are needed that will allow the economic and wider value of ecosystem functioning to human well being to be realised in decision making processes. (A17)
- It is vital to engage all stakeholders in landscape scale decision making. (A19)
- Conservation planning needs to consider: management and administrative boundaries; partnerships and dialogues between institutions; and shared and commonly agreed visions and goals. (B61)

**Principle 4:** *Recognizing potential gains from management, there is usually a need to understand and manage the ecosystem in an economic context. Any such ecosystem-management programme should: (a) reduce those market distortions that adversely affect biological diversity; (b) align incentives to promote biodiversity conservation and sustainable use; and (c) internalize costs and benefits in the given ecosystem to the extent feasible.*

***Positive feedback***

- Benefit sharing mechanisms have the potential for involving disparate stakeholders who do not typically identify themselves as having common interests. (A24)
- Local level economic resource valuation helped build awareness of the need for measures to ensure the sustainable use of the resource base. (B35)
- Wildlife protection is best ensured when producer communities are given an economic and management stake in the wildlife resource. (B36)
- Economic valuation has allowed the long term value of wildlife to be contrasted with agriculture, cultural and political factors. (B36)
- Conservation goals were best achieved if local human economic and cultural needs were met. (B41)
- The importance of providing alternative livelihood strategies outside the Reserve is emphasised. (B41)
- Benefit sharing has been strengthened through granting use, access and some hunting revenues to local communities. (B41)
- Local users of natural resources are willing to collaborate in conserving their environment if economic benefits, property rights and access to land are not diminished or affected. (B47)
- Low but continuous economic investment is required. (B47)
- Implemented changes in incentive measures such as the removal of subsidies for pesticides, and the application of taxes on pesticides. (B54)
- Total economic value is a powerful tool for demonstrating the cost effectiveness of meeting CBD objectives to policy makers. (B55)
- It is essential to work with farmers and address socio-economic priorities as the entry point for biodiversity recovery and environmental restoration. (B56)
- Promotion of trade of NTFPs benefits the poorest as they use the income to buy rice. (B57)
- Equitable sharing of costs and benefits is very difficult to apply in practice - conservation measures often impose livelihood costs on those least able to bear them. (D9)

***Negative feedback***

- It is unlikely that costs and benefits can be internalised within ecosystems in every case, as some functions (i.e. carbon sequestration) benefit the planet. (A8)
- Statutes, regulatory or prescriptive approaches are often the most difficult to enforce. (A24)
- There are obstacles to the implementation of the EA in countries with economies in transition - due to a desperate need for wealth based on resource exploitation. (B57)

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### ***Lessons learned***

- Delivering the CBD objectives through the EA may require socio-economic priorities to be addressed before biological and ecological concerns. (A8)
- Non-prescriptive mechanisms based on the active support of stakeholders have the greatest chance of success. (A24)
- The removal of perverse incentives is a priority if societal choice is to appropriately balance the economic needs of people with the conservation and sustainable use of biodiversity. (A26)
- Guidelines on benefit sharing and incentives need to be developed to implement the EA. (A24)
- Conservation and sustainable use objectives cannot be achieved unless education, health, gender equity, transport, incomes and human well being are first improved. (B35)
- A range of incentives, from increased yields to a sustainable supply of valued products, is needed to make the participation of diverse stakeholders worthwhile. Peoples' interest in the EA is dependent on immediate financial benefits. However, financial benefits do not require activities to be subsidised by payments, since thinking and action ecologically can sometimes bring savings to producers. (B41)
- By meeting peoples' legitimate interests you can obtain their co-operation and encourage them into collective action for conservation purposes. (D9)

**Principle 5:** *Conservation of ecosystem structure and functioning, in order to maintain ecosystem services, should be a priority target of the ecosystem approach.*

### ***Positive feedback***

- Effective conservation of ecosystems should involve looking at not just a single species but all species that occur. (B36)
- Focus on the value of individual species (and neglect of the function of the species) has led to over harvesting of some species and unknown ecological effects. (B38)
- Conservation of ecosystem functioning and processes was an important objective as many NTFPs are dependent on particular ecosystem types. (B57)

### ***Negative feedback***

- There is a lack of scientific assessment and quantification of the services provided by most ecosystems, and an absence of generally agreed mechanisms for the valuation of ecosystem services. (A25)
- There are deficiencies in the technical understanding of ecosystem functioning. (A31)
- It is important that particular key species within an ecosystem are identified for conservation actions, while recognising the functional relationships in ecosystems. (B36)
- The scientific knowledge on the valuation of ecosystem services is not fully developed. (B31)
- The idea of introducing ecological services into some of the current economic concepts is attractive, but not supported by any practical steps or working methodology concerning their assessment and incorporation into economic realities. (B58)

### ***Lessons learned***

- Standardising procedures for evaluating ecosystem services under the CBD may significantly increase the impact of the EA. (A26)

- The physical and socio-economic aspects of ecosystem functioning should be researched as a priority. (A34)
- There is a need to translate the concept of ecosystem functioning into useful management guidelines and indicators (for example, how do you set performance criteria for ecological functioning of particular areas). (B61)

**Principle 6:** *Ecosystems must be managed within the limits of their functioning.*

***Positive feedback***

- Over harvesting of non timber forest products was an obstacle to sustainable management. (B38)
- Focus on the value of individual species (and neglect of the function of the species) has led to over harvesting of some species and unknown ecological effects. (B38)

***Negative feedback***

- How do you ascertain the functional limits of an ecosystem? (B61)

***Lessons learned***

- In light of the lack of scientific information needed to implement the EA, then the 'precautionary principle' must be recognised as a necessary and valid approach. (B17)
- Definitions and methods to measure 'functional limits' and 'carrying capacity' need to be developed. (B82)

**Principle 7:** *The ecosystem approach should be undertaken at the appropriate spatial and temporal scales.*

***Positive feedback***

- Community involvement and participation is an involving and long process for which resources and time should be well planned for. (B40)

***Negative feedback***

- The most appropriate scale for management is best defined by the specific problem being addressed. (A7)
- Ecosystems need to be managed at multiple scales. (B54)
- Two scales of management were identified: regional and local. (B55)
- A combination of scales were found to be appropriate. (B57)
- A key challenge to ecoregion conservation is the linking of the top-down vision and bottom-up needs of local people. (B60)

***Lessons learned***

- Regional economic valuation of resources can assist in integrating transboundary planning. (B35)
- Temporal scale should consider the problem complexity and the length of time likely to be needed to achieve a collaborative and co-operative approach between all stakeholders. (B17)

- Spatial scale should be determined in relation to the problem (site to region to planet). It is also essential to consider issues beyond the boundaries where there are likely impacts (idea of a 'problem-shed'). (B17)
- There is a need for a multi-level perspective and for the link of top-down with bottom-up approaches. (B23)
- The EA needs to tackle the divergence of common national and regional goals and local interests, as well as the tension between large scale interests of economy and regional management objectives. (B23)
- The EA clearly needs a multi-level perspective and sufficiently flexible institutions to tackle the inherent centralisation/decentralisation dilemma in ecosystem management. (B30)

**Principle 8:** *Recognizing the varying temporal scales and lag-effects that characterize ecosystem processes, objectives for ecosystem management should be set for the long term.*

#### ***Positive feedback***

- Improvements to the conservation and ecosystem service status were not fully evident within the five year project period. (B35)
- Long term political support is necessary to provide the continuity that is essential for ecosystem restoration. (B55)

#### ***Negative feedback***

- Given that individuals and communities often depend on natural resources for their source of livelihood, immediate incentives are needed if long term aims are to be delivered. (A7)
- Long term objectives are central to the EA, but there is insufficient emphasis on the need for communities involved in delivering the EA to enjoy immediate benefits. (A22)
- People in need are generally those who are socially and economically marginalised - their immediate needs are different to the long term objectives of the EA. (A22)
- Short-term nature of 'projects' is considered a major constraint to the implementation of the EA. (A22)
- Balancing the need for long term objectives and short term economic gain is important. (B58)

#### ***Lessons learned***

- The different time scales of various stakeholders is difficult to change, so they must be managed if the EA is to be implemented. (A23)
- Immediate incentives are needed if long-term aims are to be delivered. (A23)
- Immediate delivery of benefits to the people responsible for conservation and sustainable use is vital. (B35)
- Conservation with or through communities needs to work at the pace of those communities and not the pace of outsiders such as implementing institutions, donors or other externally determined deadlines. (B36)
- Ecological monitoring systems need to be built into implementation programs. (B61)
- There is a need for long term financial and political commitment. (D4)
- Must remember that 'effective' capacity building takes a long time. (D4)

**Principle 9:** *Management must recognize that change is inevitable.*



***Positive feedback***

- Adaptive management was seen to be important (but not yet applied). (B36)
- It is important to have a reliable and functioning monitoring system to help with decision making. (B36)
- Support is needed as a priority to develop ecological monitoring. (B41)
- A number of adaptive management strategies were tested. (B57)
- Adaptive management is vital is local level observations are to result in appropriate changes in management practices. (B59)

***Negative feedback***

- Adaptive management was recognised as a new science to many stakeholders. (A23)
- Not all changes are inevitable - some anthropogenic changes (degradation from exploitation) should be avoided. (B85)

***Lessons learned***

- Training is needed to build understanding and ability in adaptive management, since it is a new approach for many organisations and individuals. (A23)
- Monitoring of appropriate indicators is vital for adaptive management, yet guidelines and case studies are lacking. (A24)
- In light of the lack of scientific information needed to implement the EA, then adaptive management must be recognised as a necessary and valid approach. (B17)

**Principle 10:** *The ecosystem approach should seek the appropriate balance between, and integration of, conservation and use of biological diversity.*

***Positive feedback***

- The protected area (biosphere reserve) is subject to limited grazing and agriculture, fruit picking and hunting, and ritual use – to allow the integration of conservation and use of biological diversity. (B41)
- The initiative recognises that a balance between resource use (hunting) and conservation of habitat is essential for meeting conservation objectives in the long term. (B53)
- Agricultural biodiversity is of great importance. (B54)
- Integrated reforestation with agriculture is practical, profitable and sustainable. (B56)
- Key aspect of IPM is the conservation of natural enemies of crop pests, which depends on high soil OM and a functioning agro-ecosystem. (B54)
- The government allocated forest land to local people, and in return for forest protection and restoration activities, they can harvest seafood. (B55)
- The study advocates a balance between conserving wetlands that improve water quality and promotion of agriculture that benefits from improved water quality. (B56)

***Negative feedback***

- Guidelines are needed to on how to use the EA to achieve in situ conservation such as protected areas. (A8)
- Who decides the appropriate 'balance' - the wording can be open to misinterpretation. (B83)

- The reality of many conservation projects is that livelihood outcomes are weak, tokenistic and counterproductive. (D9)

#### ***Lessons learned***

- We must shift our attention away from the myth of a win-win between development and conservation objectives and concentrate on understanding how land use trade offs can be equitably balanced. (D9)

**Principle 11:** *The ecosystem approach should consider all forms of relevant information, including scientific and indigenous and local knowledge, innovations and practices.*

#### ***Positive feedback***

- The EA can assist integration of diverse findings and allow modelling of multiple variables for scenario development. (B52)
- Indigenous and local knowledge of fish resources can be key to successful biodiversity conservation and management. (B59)

#### ***Negative feedback***

- It is difficult to integrate scientific information with local knowledge. (A27)
- Few people have the multi-disciplinary expertise needed to make decisions under the EA, as it requires diverse information from a wide range of stakeholders. (A27)
- There are inadequate exchanges of information between and within institutes organisations. (A31)

#### ***Lessons learned***

- Existing information needs to be made available, ideally in a processed form that non-expert decision makers can interrogate. (A26)
- User friendly decision support tools that integrate multidisciplinary knowledge should be developed and disseminated.(A34)
- Professionals from non-conservation sectors of the economy and society should be made aware of the EA. (A34)

**Principle 12:** *The ecosystem approach should involve all relevant sectors of society and scientific disciplines.*

#### ***Positive feedback***

- Participation of the widest possible range of stakeholders and sectoral interests in planning and management is vital. (A19)
- The success of the project in changing attitudes towards natural resources comes from the local involvement of diverse stakeholders, including churches, research institutions, NGOs, business and government. (B37)
- Early involvement of the various sectors, particularly at the local level, is essential for success. (B43)
- High level political support is considered a key feature for the success of the initiative. (B43)
- High level of political and communication support is needed for the development of the overall management system. (B45)

- A high level of communication between the different sectors of the area was identified as a key component of the approach. (B48)
- Different actors from components of the process should be involved from the beginning, during the planning and discussion stages. (B49)
- The success of the project was possible through the collaboration between the private oil enterprises, local and national NGOs, scientific sector, government support and local communities. (B51)
- Multi-disciplinary and multiple stakeholder involvement is crucial from the beginning of the project. (B52)
- Local actions benefit greatly from intersectoral policy measures. (B54)
- Intersectoral cooperation is vital as the Delta needs to be managed as a whole. (B56)
- The lack of intersectoral cooperation is recognised to be a major obstacle to delivering the EA, as the management of various zones is the responsibility of different government sectors. (B58)
- Management that effectively balances conservation, sustainable use and equitable sharing of benefits of genetic resources requires intersectoral and multi-stakeholder decision making. (B59)

### *Negative feedback*

- The sectoral structure is a major constraint to the adoption of the EA. (A8)
- There are often barriers to information flow between organisations. (A8)
- It is unlikely that new integrated decision making structures can be formed in most countries. (A8)
- Active and sustained participation cannot be assumed, even when all stakeholders are encouraged to be involved. (A18)
- Participating institutions at the field level lacked the capacity to facilitate a participatory approach, having been used to conventional instructive approaches. (B40)
- Who are stakeholders? - those whose actions can affect the outcome of an activity, or those who are affected by the activity - and how can we prioritise between stakeholders at different levels? (D9)

### *Lessons learned*

- Policies, laws, fiscal measures, incentives and institutional mandates should be harmonised as a priority to enable implementation of the EA. (A8)
- Inter-ministerial working groups or committees may be appropriate for creating the linkages between decision making sectors. (A8)
- Existing inter-sectoral structures, such as inter-ministerial committees, should adopt responsibility for mainstreaming the EA into cross-sectoral decision making. (A33)
- EA reports need to be packaged into appropriate formats for the different stakeholders to use. (B35)
- A clear and shared vision of project outcomes is necessary to solve problems. This can only be achieved through a visioning process that is truly inclusive of all relevant stakeholders. (B18)
- The integration of different ways of thinking (science, management) should be facilitated. (B23)
- Information sharing is crucial for the involvement and empowerment of stakeholders. (B24)
- The interests of primary and secondary stakeholders should be accommodated as far as possible. In particular, consideration should be given to local stakeholders who are most likely to be disadvantaged by conservation and exploitation activities. (B44)
- The active participation of stakeholders is dependent on equal access to information. (B44)

### ***C. EA Operational Guidance***

In the review of case studies and analyses, it was difficult to differentiate between feedback on principles and statements of operational guidance, given the overlap between the two. In these notes, all statements on feedback and lessons learned are listed under the relevant principle.

***Guidance 1:*** focus on ecosystem functions (see Principle 5)

***Guidance 2:*** benefit sharing, economic management (see Principle 4)

***Guidance 3:*** adaptive management (see Principle 9)

***Guidance 4:*** decentralisation to the lowest level (see Principle 2)

***Guidance 5:*** inter-sectoral cooperation (see Principle 12)

### ***D. EA Implementation***

#### ***Negative feedback***

- There is ineffective stakeholder participation in planning and management. (A31)
- There is inconsistent use of terminology and definitions. (A31)
- There is insufficient institutional cooperation and capacity. (A31)
- There is an overriding influence of perverse incentives and conflicting political priorities. (A31)
- There is a lack of capacity to implement the EA in many countries. The principle of the EA could provide a framework for analysis for ecosystem management and ensure accountability and transparency for ecosystem managers. (B24)
- The EA is hardly known as a management concept. (B24)
- There is little evidence that the next steps of integrating the EA into the existing set of operational policies have advanced considerably (in international organisations). (B33)
- A major problem with implementing the EA is the reconciliation of peoples' aspirations with biodiversity concerns, and once societal choice is expressed, the ability of authorities to deliver the vision expressed by the people. (C8)
- Implementation can be inhibited by a lack of co-ordination and conflicting institutional policies within government. (E9)

#### ***Lessons learned***

- Mainstreaming the EA requires the engagement of professionals from all sectors of the economy and society – highly targeted workshops. (A7)
- Delivering the CBD objectives through the EA may require socio-economic priorities to be addressed before biological and ecological concerns. (A8)
- Policies, laws, fiscal measures, incentives and institutional mandates should be harmonised as a priority to enable implementation of the EA. (A8)
- Inter-ministerial working groups or committees may be appropriate for creating the linkages between decision making sectors. (A8)
- Regional political structures should be used to address transboundary problems under the EA. (A8)
- The EA is consistent with the objectives of other international environment conventions. This synergy can be used to promote collective implementation. (A8)
- Increased capacity of the CBD National Focal Points could help drive implementation (A8) - example of the roles and responsibilities are in Table 7. (A29)

- Popular media (radio plays and songs) using local community artists were important for raising awareness of wetland values and sustainable use. (B35)
- Improved public awareness and institutional capacity building of the EA are needed urgently. (B24)
- An enabling environment must be created to implement the EA. (B13-15)
- International diffusion of the EA requires flexible international organisations and networks that can adopt and facilitate the EA. (B30)
- Implementation on the ground will take place at the national and sub-national level, and will depend on institutional and political support, as well as social and economic capacity. (B30)
- Detailed recommendations on how to implement the EA. (B44-47)
- International agreements will only be effective if enforced and implemented at the local level, otherwise economic forces will prevail. (E8)
- There is an urgent need to review government frameworks with the aim of harmonizing policies. (E9)

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